I. Amendments to the Specification

Please replace the specification with the following. A clean version of the amended specification is enclosed as Attachment A.

~~DESCRIPTION~~

SIDE CURTAIN AIR BAG

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Japanese patent application serial number 2003-366237, filed October 27, 2003 and PCT/JP2004/015912, filed October 27, 2004.

~~Technical Field~~

BACKGROUND

1. Field of the Invention

[0002] The present invention relates to a side curtain air bag which is designed to protect a head of an occupant inside ~~the~~ a vehicle by being expanded and developed during lateral collisions or turnover accidents, and to prevent the occupant from being thrown out ~~of a~~ of the vehicle.

~~Background Art~~

2. Description of Related Art

[0003] ~~The related art side curtain air bags (hereinafter, simply referred to as an air bag) can be seen in reference documents.~~

~~Patent Document 1: JP-A-2001-270413~~

~~Patent Document 2: JP-A-2001-233155~~

~~Patent Document 3: JP-A-2001-328503~~

~~Patent Document 4: JP-A-2002-283949~~

~~Patent Document 5: JP-T-2002-503581~~

[0004] ~~A side~~ In existing side curtain air bags, a side curtain air bag module 100, as shown in Fig. 8, is attached along a roof side rail 101 inside a vehicle. At the time of a collision, as shown in Fig. 9, an air bag 103 included in the side curtain air bag module 100 expands and develops ~~in a~~ into a curtain shape between an occupant and a side component in a vehicle, such as a door, by gas supplied from ~~an inflator~~ a gas generator 102, so as to protect the occupant from the side component.

[0005] The air bag 103 starts to expand and develop at the initial stage of the collision and comes into protective contact with the head of the occupant., ~~on the purpose of protection.~~ Therefore, when the air bag expands ~~and develops~~, if the expansive force of the ~~entire~~ air bag 103 is excessively ~~strong thus making~~ high and makes the air bag 103 ~~be too~~ too hard, the expansive force may harm rather than protect the occupant. Accordingly, the expansive force of the ~~entire~~ air bag is preferred to be relatively low and soft at the initial stage of the collision, ~~that is,~~ when the air bag expands and develops.

[0006] In the meantime, at the latter stage of the collision, in order to prevent an occupant from being thrown out ~~of a~~ the vehicle ~~due to overturn of the vehicle, after a predetermined time from the collision, that is, after the air bag 103 is developed,~~ if it overturns during the collision, the air bag 103 needs to have a relatively high tension. ~~so as~~ This is necessary to maintain ~~a position of being~~ an expanded ~~in the fullest~~ position along a full forward and backward direction in a curtain shape, ~~because it is necessary~~ to prevent the occupant from being thrown out of the vehicle. For this reason, a ~~string~~ tether 104 is attached to the leading and trailing sides below the air bag 103 to keep the air bag 103 in the expanded position. One end of the ~~string~~

tether 104 is attached to the air bag 103, and the other end thereof is attached to a chassis.

~~Disclosure of the Invention~~

~~Problems to be Solved by the Invention~~

[0007] However, in the related art air bag 103~~, when a strong tension is needed after the air bag expands and develops,~~ the tension ~~is set to be high~~ set by the ~~string~~ tether 104 ~~from the time when~~ is high as soon as the air bag starts to expand and develop. Therefore, in the prior art it is difficult to ~~control~~ make the tension ~~of the~~ across the air bag ~~to be~~ low when the air bag initially starts to expand and develop, and ~~to be~~ become high when the air bag is developed.

[0008] ~~It is an object of the invention to provide~~ In view of the above, it is apparent that there exists a need for an air bag which is capable of controlling the tension ~~of the~~ across the air bag ~~properly and easily~~ during initial expansion and after full expansion.

~~Means for Solving the Problems~~

SUMMARY

[0009] ~~According to a first aspect of the invention, there is provided~~ In satisfying the above need, as well as overcoming the enumerated drawbacks and other limitations of the related art, the present invention provides a side curtain air bag which has chambers expanded by gas supplied from ~~an inflator~~ a gas generator, and expands and develops ~~in a~~ into a curtain shape ~~at side~~ along a side part of a vehicle so as to protect vehicle occupants.

[0010] Further, the side curtain air bag includes primary chambers which expand to ~~develop~~ form the side curtain air bag; and a secondary chamber which expands

later than the primary chambers to apply an additional tension ~~on the~~ across the developed side curtain air bag.

[0011] Furthermore, the secondary chamber may have an opening communicating with the primary chamber, and may be expanded ~~by the~~ by an inflow of the gas from the primary chamber.

[0012] ~~Further, according~~ According to a second ~~aspect~~ embodiment of the invention, ~~there is provided a~~ the side curtain air bag ~~which has~~ includes chambers expanded by gas supplied from ~~an inflator~~ the gas generator, and expands and develops ~~in a~~ into a curtain shape ~~at side~~ along the side part of ~~a vehicle~~ the vehicle so as to protect the vehicle occupants. The side curtain air bag includes a primary chamber which expands so as to protect an occupant; a secondary chamber which applies tension on the side curtain air bag after the side curtain air bag is expanded and developed; and a set of ~~strings~~ tethers, each tether having one end attached to the side curtain air bag at a joint end and the other end attached to a vehicle at a fixation ~~end,~~ end in the forward and backward direction of the vehicle. In this case, when the side curtain air bag expands and develops, the secondary chamber is disposed such that a portion or all of the secondary chamber overlaps a virtual band ~~region~~, the virtual band ~~region~~ being ~~formed of~~ defined by a first virtual line connecting the respective fixation ends of the one ~~set of strings~~ pair of tethers and a second virtual line connecting the respective joint ends of the one ~~set of strings~~ pair of tethers.

[0013] ~~Further, the~~ The secondary chamber may expand later than the primary chamber.

[0014] ~~Furthermore,~~ In addition, the secondary chamber may have an opening communicating with the primary chamber, and may be expanded by the inflow of the gas from the primary chamber.

[0015] According to a third aspect of the invention, there is provided a side curtain air bag which has chambers expanded by gas supplied from an inflator, and expands and develops in a curtain shape at side part of a vehicle so as to protect occupants. The side curtain air bag includes a primary chamber which expands so as to protect an occupant; a secondary chamber which applies tension on the side curtain air bag after the side curtain air bag is expanded and developed; and a set of strings, each having one end attached to the side curtain air bag at a joint end via an attachment part of the side curtain air bag and the other end attached to a vehicle at a fixation end, in the forward and backward direction of the vehicle. In this case, when the side curtain air bag expands and develops, the secondary chamber is disposed such that a portion or all of the secondary chamber overlaps ~~a virtual~~ an alternate virtual band ~~region~~, the alternate virtual band ~~region~~ being ~~formed of~~ defined by a first virtual line connecting respective upper ends of attachment ~~parts~~ points of the one ~~set~~ pair of ~~strings~~ tethers and a second virtual line connecting respective lower ends of the attachment ~~parts~~ points of the one ~~set~~ pair of ~~strings~~ tethers.

[0016] ~~Further,~~ As above, the secondary chamber may expand later than the primary ~~chamber.~~ chamber, and it may include. ~~Furthermore, the secondary chamber may have~~ an opening communicating with the primary chamber, ~~and~~ such that the secondary chamber may be expanded by the inflow of the gas from the primary chamber.

[0017] According to a fourth ~~aspect~~ embodiment of the invention, there is provided a side curtain air bag which has chambers expanded by gas supplied from an inflator, and expands and develops in a curtain shape at side part of a vehicle so as to protect occupants. The side curtain air bag includes a primary chamber which expands so as to protect an occupant; a secondary chamber which applies tension on the side curtain air bag after the side curtain air bag is expanded and developed; and a set of strings, each having one end attached to the side curtain air bag at a joint end via the attachment part of the side curtain air bag and the other end attached to a vehicle at a fixation end, in the forward and backward direction of the vehicle. In this case, when the side curtain air bag expands and develops, the secondary chamber is disposed such that a portion or all of the secondary chamber overlaps ~~a virtual~~ yet another virtual band, this ~~region, the~~ virtual band ~~region~~ being ~~formed of~~ defined by a first virtual line connecting the upper end of the attachment part of one ~~string~~ tether and the fixation end of the other ~~string~~ tether, and a second virtual line connecting respective lower ends of the attachment ~~parts~~ points of the one set of ~~strings~~ tethers.

[0018] ~~Further,~~ Again, the secondary chamber may expand later than the primary ~~chamber.~~ chamber, and ~~Furthermore,~~ the secondary chamber may have an opening communicating with the primary chamber~~, and~~ such that the secondary chamber may be expanded by the inflow of the gas from the primary chamber.

~~Effects of the Invention~~

[0019] The air bag according to the present invention includes the primary chamber which expands to develop the air bag; the secondary chamber which applies an additional tension on the developed air bag, and the secondary chamber gradually expands later than the primary chamber is expanded. Therefore, it is

possible to gradually increase the tension ~~of the~~ across the entire air bag. Accordingly, it is easy to properly control the tension of the air bag.

[0020] As a result, at the initial stage of the collision, the air bag protects the head of occupants while maintaining relatively low tension ~~of the~~ across the entire air bag so as to be soft, and ~~sequentially,~~ at the latter stage of the collision, the air bag prevents the occupants from being thrown out of the vehicle by turnover accidents ~~while~~ by maintaining relatively high tension ~~of the~~ across the air bag ~~so as to be~~ when developed to the fullest.

[0021] Further, the secondary chamber is disposed such that a portion or the entire secondary chamber overlaps a virtual band ~~region~~. The virtual band region may be ~~formed~~ defined by of a first virtual line connecting the respective fixation ends of the one set of ~~strings~~ tethers and a second virtual line connecting the respective joint ends of the one set of ~~strings,~~ tethers; the virtual band region may also be formed of a first virtual line connecting respective upper ends of attachment ~~parts~~ points of the one set of ~~strings~~ tethers and a second virtual line connecting respective lower ends of the attachment ~~parts~~ points of the one set of ~~strings,~~ tethers; and the virtual band region may be formed of a first virtual line connecting the upper end of the attachment part of one ~~string~~ tether and the fixation end of the other ~~string~~ tether, and a second virtual line connecting respective lower ends of the attachment ~~parts~~ points of the one set of ~~strings~~ tethers. Therefore, the tension created by the expansion of the secondary chamber, after the primary chamber is expanded and developed, is applied on the primary chamber ~~through~~ along the ~~respective~~ virtual band ~~regions~~ region. As a result, it is possible to prevent the occupants from being thrown out of the vehicle by turnover accidents or the like ~~while~~ by maintaining high tension of the entire air bag following initial expansion.

[0022] Further objects, features and advantages of this invention will become readily apparent to persons skilled in the art after a review of the following description, with reference to the drawings and claims that are appended to and form a part of this specification.

DESCRIPTION OF THE DRAWINGS

[0023] Fig. 1 is a cross-sectional view showing the entire air bag according to a first embodiment of the invention.

[0024] Fig. 2 is an enlarged view of main parts of the air bag according to the first embodiment of the invention.

[0025] Fig. 3 is a cross-sectional view of the air bag 1 taken along the line C-C of Fig. 2.

[0026] Fig. 4 is a graph showing the internal pressure change of primary and secondary chambers 3 and 2 according to the first embodiment of the invention.

[0027] Fig. 5 is a view showing the relationship of a virtual band region and the secondary chamber.

[0028] Fig. 6 is a view showing the relationship of a virtual band region and the secondary chamber.

[0029] Fig. 7 is a view showing the relationship of a virtual band region and the secondary chamber.

[0030] Fig. 8 is a view showing a side curtain air bag module according to the related art.

[0031] Fig. 9 is an explanatory view showing an operation of a side curtain bag module according to the related art.

DETAILED DESCRIPTION OF THE INVENTION

[0032] ~~Best Mode for Carrying Out the Invention~~

[0033] ~~Hereinafter, an~~ An air bag 1 according to a first embodiment of the present invention will be described with reference to ~~the accompanying drawings.~~ Fig. 1 ~~is a~~ which shows a cross-sectional view of ~~showing~~ the ~~entire~~ air bag 1 ~~according to a first embodiment of the invention~~. Fig. 2 is an enlarged view of ~~main parts of~~ the air bag 1 of Fig. 1. ~~according to the first embodiment of the invention.~~ Fig. 3 is a cross-sectional view of the air bag 1 taken along the line C-C of Fig. 2. Fig. 4 is a graph showing the internal pressure change of primary chamber 3 and secondary ~~chambers 3 and~~ chamber 2 according to the ~~first~~ embodiment of ~~the invention~~ Fig. 1.

[0034] ~~Further, in the embodiment of~~ In addition, in reference to the air bag of the present invention, the descriptions forward, backward, left, and right ~~directions are~~ refer to the directions in which the air bag is attached to the inside of a vehicle as the air bag 1 expands and develops ~~in a~~ into a curtain shape.

[0035] The air bag 1 according to ~~the~~ a first embodiment of the present invention is a pouch-shaped air bag formed by integrally superimposing a sheet of flexible material having the section shown in Fig. 1 upon another sheet of material having a section that is ~~axisymmetrical to~~ a mirror image of the section shown in Fig. 1.

[0036] The air bag 1 may be formed of two sheets of ~~texture~~ material, ~~such as textile that is~~ that are woven together into a predetermined pouch-shape.~~; otherwise,~~ Otherwise, the airbag 1 may be formed of ~~one~~ a single sheet of ~~textile~~ material that is initially woven into a pouch-shape.

[0037] As shown in Fig. 1, the air bag 1 ~~is provided with~~ includes a plurality of front seat inflation ~~parts~~ chambers 3, 4, 5, 6, and 7 (first through fifth chambers

respectively); a plurality of back seat inflation ~~parts~~ chambers 8, 9, and 10 (sixth through eighth chambers respectively); a gas supply passage 11; a front non-inflation part 12; an intermediate non-inflation part 13; a back non-inflation part 14; a plurality of attachment ~~pieces~~ tabs 15 arranged to couple to ~~toward~~ a roof side rail; a gas supply port 16; and a secondary chamber 2.

[0038] ~~The front seat inflation parts 3, 4, 5, 6, and 7 include a plurality of first, second, third, fourth, and fifth chambers 3, 4, 5, 6, and 7. The back seat inflation parts 8, 9, and 10 include a plurality of sixth, seventh, and eighth chambers 8, 9, and 10.~~ The plurality of chambers 3, 4, 5, 6, 7, 8, 9, and 10 ~~is~~ are expanded by gas ~~that is~~ supplied from ~~an inflator~~ a gas generator at the time of initial collision.~~, and~~ The chambers 3, 4, 5, 6, 7, 8, 9 and 10 when expanded by the gas ~~functions~~ function together as ~~the~~ a primary chamber which ~~causes the entire~~ forms the air bag ~~to expand~~ as it expands and ~~develop~~ develops.

[0039] The gas supply port 16 is ~~disposed~~ included on an upper trailing end of the air bag 1. The gas supply passage 11 is ~~disposed~~ arranged above the ~~respective primary~~ chambers 3, 4, 5, 6, 7, 8, 9, and 10 so as to supply gas to the ~~respective primary~~ chambers 3, 4, 5, 6, 7, 8, 9, and 10 from the gas supply port 16. The ~~respective primary~~ chambers 3, 4, 5, 6, 7, 8, 9, and 10 are all open to the gas supply passage 11.

[0040] The secondary chamber 2 is ~~disposed~~ included in front of the first chamber 3 ~~in a row in~~ along the forward and backward direction.~~, and the~~ The first chamber 3 is ~~disposed~~ arranged in the ~~forefront~~ forwardmost position of the front seat inflation part. ~~The forefront~~ This position results in the secondary chamber 2 ~~actually involves in~~ applying extra tension to the air bag 1 in the forward and

backward direction, when the secondary chamber 2 is expanded after ~~later~~ than the ~~primary~~ chambers 3, 4, 5, 6, 7, 8, 9, and 10.

[0041] The secondary chamber 2, as shown in Fig. 2, has an opening A communicating with the first chamber 3 of the primary chamber~~, gas~~ such that gas of the ~~inflator~~ gas generator is supplied to the secondary chamber through the first chamber 3. The size of the opening A is smaller than that of an opening B of the first chamber 3 (see Fig. 1) which communicates with the gas supply passage 11.~~, and~~ As a result of this arrangement, the secondary chamber 2 is expanded ~~later~~ after ~~than~~ the primary chambers 3, 4, 5, 6, 7, 8, 9, and 10. By varying the aperture of the opening A, the time required for the secondary chamber 2 to expand can be controlled.

[0042] Referring to Fig. 1, a leading ~~A leading~~ end 1a of the air bag 1 ~~has a~~ includes a first joint end 18b of a first tether ~~string~~ 18 sewn to ~~an attachment~~ a first attachment ~~part~~ point 19 that is ~~disposed at~~ arranged on the front non-inflation part 12.~~, and the~~ The air bag 1 is connected to ~~the~~ a chassis of the vehicle by ~~as the other end of the string 18 is connected to~~ a first fixation end 18a of the first tether 18 that is fixed to the vehicle (not shown). ~~Further, a~~ A trailing end 1b of the air bag 1 ~~has~~ includes a second joint end 20b of a ~~string~~ second tether 20 sewn ~~to an~~ to a second attachment ~~part~~ point 21 ~~that is disposed at an extension~~ included on a protrusion 14a extending backward from the back non-inflation part 14.~~, and the~~ The trailing end 16 of the air bag 1 is then connected to the chassis ~~as the other end of the string 20 is connected to a fixation end 20a that is fixed to~~ of the vehicle~~. Further, the~~ by a second fixation end 20a of the second tether 20.

[0043] The first attachment ~~part~~ point 19 and the second attachment ~~part~~ point 21 may be made of metal, or another rigid material, that is unlikely ~~deformable even~~

to deform when the air bag 1 expands. ~~Otherwise,~~ However, the first attachment ~~part~~ point 19 may also be made of deformable materials which deform ~~corresponding to the~~ expansion of the air bag 1~~, such as an enforced part of an additional sewn product that is strongly sewn~~ For example, a reinforced portion may be provided by sewing additional material to the front non-inflation part 12 ~~by a sewing machine~~ to form the first attachment point 19. ~~That is, the~~ The first and second attachment ~~parts~~ points 19 and 21 ~~involve in the connection~~ provide a point to connect the air bag 1 to the vehicle chassis by the ~~strings~~ tethers 18 and 20~~, when~~ When the air bag 1 expands~~, and develops; and a strong tension is~~ significant force may be applied~~, thereon, and thus the~~ requiring high strength first and second attachment ~~part~~ points 19 and 21 ~~partially needs strength so~~ to bear ~~with~~ the tension in the tethers 18 and 20. Further, the first and second attachment points 19 and 21 include lower ends 19a and 21a and upper ends 19b and 21b. ~~of the attachment parts 19 and 21 are attached parts indicating upper and lower ends of the enforced part.~~

[0044] Further, in this embodiment, ~~as for~~ a virtual band is defined between the positions of the first and second attachment ~~parts~~ points 19 and 21, ~~a virtual line which connects the attachment part 19 and the attachment part 21 inclinedly crosses~~ across the air bag 1 ~~in a direction~~ from the attachment part 19 upward to the attachment part 21. In addition, the second fixation end 20a of the ~~string~~ tether 20, which is fixed to the chassis, is located above the second attachment ~~part~~ point 21~~, the fixation~~ The first fixation end 18a of the ~~string~~ tether 18, which is fixed to the chassis, is located substantially at the same height as the first attachment ~~part~~ point 19. A virtual line which ~~connects these fixation~~ runs between the first and second fixation ends 20a and 18a ~~inclinedly~~ crosses the air bag 1, ~~as same~~ as described above. ~~However,~~ The above is one example, and various modifications of the

arrangement of the first and second attachment ~~parts~~ points 19 and 21 and the first and second fixation ends 20a and 18a are possible, according to the requirements of a particular application. ~~kinds of vehicles and air bags.~~

[0045] ~~In~~ When using the air bag 1 ~~with this constitution,~~ of the present invention ~~when overturn of a~~ and the vehicle overturn, or collision occurs, ~~and~~ gas of the ~~inflator~~ gas generator is supplied ~~from~~ to the gas supply port 16, ~~at the initial stage of the collision,~~ and all of the primary ~~chamber~~ chambers 3, 4, 5, 6, 7, 8, 9, and 10 expand and develop ~~the entire air bag 1~~ at the initial stage of the collision. At this time, since force that is applied on the entire air bag 1 to expand and develop the air bag 1 is continuously supplied to the secondary chamber 2 from the primary chamber 3 through the opening A, the primary chambers 3 to 10 are controlled to be applied with relatively low force, so that the air bag 1 protects the head of an occupant while the air bag 1 is softly expanding and developing. For this reason, the air bag 1 may protect the occupant without causing harm.

[0046] Next, when gas is sufficiently supplied to the secondary chamber 2 ~~later than to~~ after the primary chambers expand, ~~an additional~~ additional tension ~~is actually applied on~~ develops across the entire air bag 1~~, which is expanded and developed,~~ in the forward and backward direction.~~, so as to increase the tension applied on the entire air bag 1.~~ In this way, the air bag 1 ~~with sufficiently~~ having high tension ~~assuredly~~ protects the occupant ~~at the~~ at a latter stage of the collision or at the time of the final overturn of the vehicle. ~~, thus reliably preventing the occupant from being thrown out of the vehicle. That is, at the time of collision or overturn of a vehicle, since the tension of the air bag is controlled corresponding to each time,~~ Thus, the added tension serves to keep the occupant ~~is not harmed~~ from harm and ~~is reliably prevented~~ prevent the occupant from being thrown out of the vehicle.

[0047] The ~~state of~~ method by which tension is applied across the ~~on the~~ air bag 1 due to the expansion of the secondary chamber 2 will be described with reference to Fig. 3. Fig. 3 is a cross-sectional view of the air bag 1 taken along the line C-C of Fig. 2. Reference symbol I indicates the initial stage of the collision, that is, a stage when the ~~primary~~ chambers 3, 4, 5, 6, 7, 8, 9, and 10 are completely expanded and the air bag 1 is completely developed after 0 to 100 mSec elapses from the time of detecting collision but before the secondary chamber 2 is completely expanded. Symbol II indicates the latter stage of the collision, that is, a stage when the secondary chamber 2 is completely expanded ~~later than~~ after the ~~primary~~ chambers 3, 4, 5, 6, 7, 8, 9, and 10 ~~after~~ completely expand 4 to 6 Sec ~~elapses from~~ after the time of detecting the collision. ~~By the~~ Upon expansion of the secondary chamber 2, the air bag 1 shrinks in the forward and backward direction by a length x, ~~and an~~ and the additional tension is applied ~~on the~~ across the air bag 1 ~~that is developed~~.

[0048] Fig. 4 is a graph showing the internal pressure change of the primary and secondary chambers 3 and 2 of Fig. 1 after expansion of the air bag 1 has initiated. ● indicates the internal pressure of the primary chamber 3, and ▲ indicates the internal pressure of the secondary chamber 2. The internal pressure of the secondary chamber 2 starts to increase ~~after~~ 1000 mSec ~~from the time of~~ after initiating the ~~development~~ expansion, ~~that is, after 1 Sec,~~ and becomes an identical pressure to that of the primary chamber 3 after 4500 mSec. ~~from the time of initiating the development.~~ In this way, ~~with~~ the structure of the air bag 1 shown in Fig. 1, ~~since~~ which permits the secondary chamber 2 to gradually ~~expands~~ expand after the primary chambers 3, 4, 5, 6, 7, 8, 9, and 10 are fully expanded, ~~it is possible to gradually~~ results in a gradual increase of the force for ~~expanding~~ tensioning the entire air bag 1.

[0049] When the air bag 1 expands and develops, the relationship between the position of the secondary chamber 2 and the first and second attachment ~~parts~~ points 19 and 21, of the ~~strings~~ tethers 18 and ~~19~~ 20, and the first and second fixation ends 18a and 20a of the ~~strings~~ tethers 18 and 20, plays a major role in the function of the air bag 1, ~~the~~ This relationship will be ~~describe with reference to~~ described in Figs. 5 to 7.

[0050] In Fig. 5, a virtual band ~~region~~ 25 is ~~formed of~~ defined along a first virtual line 23 and a second virtual line 24, ~~and~~ arranged such that the secondary chamber 2 ~~overlaps~~ is overlapped by the virtual band ~~region~~ 25. The first virtual line 23 ~~connects~~ extends between the first fixation end 18a, ~~by which the string~~ of the first tether 18 ~~is attached to the vehicle,~~ and the second fixation end 20a, ~~by which~~ of the ~~string~~ second tether 20, ~~is attached to the vehicle.~~ The second virtual line 24 connects the first joint ~~end~~ 18b of the ~~string~~ first tether 18, attached to the first attachment ~~part~~ point 19, and the joint end 20b of the string 20, attached to the second attachment ~~part~~ point 21. ~~With this structure, as described above,~~ Accordingly, when gas of the ~~inflator~~ gas generator is supplied to expand the air bag 1, ~~so as to expand the air bag,~~ and the secondary chamber 2 also starts to expand, tension is applied ~~on the~~ across the air bag 1 ~~by the~~ along the virtual band ~~region 25; therefore, it is~~ 25. Such increased tension makes it possible to more reliably prevent the occupant from being thrown out of the vehicle.

[0051] ~~The structure of Fig. 6 is~~ Fig. 6 defines an alternate arrangement of a virtual band designated at 28 and configured to achieve the same effect as that of Fig. 5. In Fig. 6, ~~a virtual~~ the virtual band ~~region~~ 28 is formed of a first virtual line 26 and a second virtual line 27, ~~and~~ arranged such that the secondary chamber 2 is ~~disposed to overlap with~~ overlapped by the virtual band ~~region~~ 28. The first virtual

line 26 connects the upper end 19b of the first attachment ~~part~~ point 19~~, by which the string 18 is attached thereto, and~~ with the ~~lower end 21a~~ upper end 21b of the second attachment ~~part~~ point 21~~, by which the string 20 is attached thereto. With this configuration, as~~

[0052] Likewise, the second virtual line 27 connects the lower ends 19a and 21a of their respective attachment points 19 and 21. Like the arrangement described above, when gas of the ~~inflator~~ gas generator is supplied to expand the air bag 1~~, and thus the air bag 1 is expanded, and~~ the secondary chamber 2 also starts to expand, causing tension ~~is applied on~~ to be applied across the air bag 1 along the ~~by the~~ virtual band region 28~~; therefore, it is possible to~~ more reliably ~~prevent~~ preventing the occupant from being thrown out of the vehicle.

[0053] The structure of Fig. 7 ~~is configured~~ shows an alternate embodiment of the present invention configured to achieve the same effect as that of Figs. 5 and 6. In Fig. 7, ~~a virtual~~ another virtual band ~~region~~ 31 is formed ~~of a~~ between a first virtual line 29 and a second virtual line 30~~, a plurality~~ A plurality of secondary chambers 2, 34 and 35 ~~is disposed to overlap with~~ are arranged to be overlapped by the virtual band ~~region~~ 31. The first virtual line 29 connects the upper end 19b of the first attachment ~~part~~ point 19 and the second fixation end 20a of the ~~string~~ second tether 20. The second virtual line 30 connects the lower end 19a of the first attachment ~~part~~ point 19 and the lower end 21a of the second attachment ~~part~~ point 21. ~~With this configuration, as described above, when~~ When gas of the ~~inflator~~ gas generator is supplied to expand the air bag 1~~, so as to expand the air bag, and~~ the plurality of secondary chambers 2, 34 and 35 also ~~starts~~ start to expand, causing tension ~~is applied on~~ to be applied across the air bag 1 along by the virtual band region 31,

and~~; therefore, it is possible to~~ more reliably ~~prevent~~ preventing the occupant from being thrown out of the vehicle.

[0054] ~~In addition, the~~ The secondary chambers 34 and 35 of the embodiment of Fig. 7 are included ~~are disposed~~ in the non-inflation part 13. The secondary chamber 34 communicates with the primary chamber 7 through an opening A1, and the secondary chamber 35 communicates with the primary chamber 8 through an opening A2.~~, and because of the~~ The openings A1 and A2~~, the~~ are configured such that the respective primary chambers 34 and 35 are slower to expand than the primary chambers 7 and 8.

[0055] In addition, ~~as for the disposition~~ it is possible to omit some of the secondary chambers 2, 34 and 35~~, the~~ since the air bag 1 ~~need not have~~ does not require all of them~~, and~~ to achieve the tension ~~on the~~ required across the air bag 1 for a particular application. ~~can be controlled according to its functional purposes. For example,~~ In addition, it is possible to ~~make different each~~ vary the amount of time that is required for ~~the respective~~ each of the secondary chambers 2, 34 and 35 to expand and develop.~~, and thus to control~~ This allows the tension applied on the air bag 1~~, by a configuration in which~~ to be controlled over time. In addition, in other embodiments the secondary chamber 2 ~~is omitted~~ may be omitted, or only ~~by another configuration in which~~ a portion of the secondary chamber ~~24~~ 34 may overlap ~~overlaps~~ the virtual band ~~region~~ 31 ~~and~~ while the entire secondary chamber 35 overlaps the virtual band region 31.~~, or by~~ Tension may also be varied by properly choosing the area of ~~aperture of~~ the openings A, A1 and A2 of the respective secondary chambers 2, 34 and 35. Changing the above features makes it ~~Therefore, it is~~ possible to configure the air bag 1 ~~which ensures~~ for each application in order to better insure the occupant's protection.

[0056] Further, the location of the secondary chamber 2 is not limited ~~to in~~ to the front of the primary chamber 3. For example, in some embodiments the secondary chamber 2 may be located ~~further~~ behind the eighth chamber 10 ~~that is located~~ at the rearmost end of the back seat inflation part. In addition, it is unnecessary that gas be supplied to the secondary chamber 2 through the primary chamber. ~~Gas~~ For example, gas may be supplied directly to the secondary chamber 2 from the gas supply port 16 through the gas supply passage 11.

[0057] In other words, modifications are allowed in the location and the number of the secondary chambers, and in the location and size of the opening for supplying gas to the secondary chamber as long as the secondary chamber expands later than the primary chamber and an additional tension is applied ~~on the~~ across the air bag that is developed.

[0058] Further, ~~the number of the~~ multiple primary and secondary chambers ~~need not be more than one,~~ are not required, that is, ~~the primary~~ there may be only one primary and secondary chamber ~~may be one,~~ respectively.

~~**[0059]** Furthermore, the invention has been described by way of the above-described embodiments, but the invention is not limited to the above described embodiments. Various modifications and changes can be made without departing from the spirit and scope of the invention.~~

~~Industrial Applicability~~

[0059] In summary, according ~~According~~ to the present invention, ~~by disposing~~ the side airbag may be provided including both a chamber that is expanded by a ~~compressed~~ the gas of the gas generator and another chamber that expands later than the first chamber. ~~in a row,~~ As a result, the present invention may be applied to

~~release impact on the body and~~ more reliably absorb ~~the~~ impact on the body of a vehicle occupant.

[0060] As a person skilled in the art will readily appreciate, the above description is meant as an illustration of implementation of the principles this invention. This description is not intended to limit the scope or application of this invention in that the invention is susceptible to modification, variation and change, without departing from spirit of this invention, as defined in the following claims.

~~Brief Description of the Drawings~~

[0061] ~~Fig. 1 is a cross-sectional view showing the entire air bag according to a first embodiment of the invention.~~

[0062] ~~Fig. 2 is an enlarged view of main parts of the air bag according to the first embodiment of the invention.~~

[0063] ~~Fig. 3 is a cross-sectional view of the air bag 1 taken along the line C-C of Fig. 2.~~

[0064] ~~Fig. 4 is a graph showing the internal pressure change of primary and secondary chambers 3 and 2 according to the first embodiment of the invention.~~

[0065] ~~Fig. 5 is a view showing the relationship of a virtual band region and the secondary chamber.~~

[0066] ~~Fig. 6 is a view showing the relationship of a virtual band region and the secondary chamber.~~

[0067] ~~Fig. 7 is a view showing the relationship of a virtual band region and the secondary chamber.~~

[0068] ~~Fig. 8 is a view showing a side curtain air bag module according to the related art.~~

[0069] ~~Fig. 9 is an explanatory view showing an operation of a side curtain air bag module according to the related art.~~

~~Reference Numerals~~

~~1 side curtain air bag~~

~~2, 34, 35 secondary chamber~~

~~3, 4, 5, 6, 7, 8, 9, 10 primary chamber~~

~~A, A1, A2 opening~~

~~18, 20 string~~

~~19, 21 attachment part~~

~~18a, 20a fixation end~~

~~19a, 21a upper end~~

~~19b, 21b lower end~~

~~23, 26, 29 first virtual line~~

~~24, 27, 30 second virtual line~~

~~15, 28, 31 virtual band region~~